

REMARKS

Claims 1-3, 5-10, 13-15, 17-21 and 23-27 were pending in the application. Claim 11 was withdrawn from consideration. By virtue of this communication, claims 3, 15 and 21 have been cancelled, claims 1, 2, 5 and 7 have been amended, and no new claims have been added. Accordingly claims 1, 2 5-10, 13, 14, 17-20 and 23-27 are currently under consideration. Amendment and cancellation of certain claims is not to be construed as a dedication to the public of any of the subject matter of the claims as previously presented. No new matter has been added.

Claim Objections

Claims 1-3, 5-10, 13-15, 17-21 and 23-27 were objected to due to informalities.

In particular, in claim 1, the Office Action argues that the term “its PN junction interface” should read –a PN junction interface between the N-type and P-type semiconductor layers--. With this communication, claim 1 has been amended to make this substitution. Thus, it is believed this objection is overcome.

Additionally, the Office Action objects to the recitation in claim 1 of a light reflecting layer “in the light-emitting diode chip”. With this communication claim 1 has been amended to delete this phrase. Thus, it is believed this objection is overcome.

Regarding claim 2, the Office Action objected to the term “on the front surface or back surface”. With this communication, claim 2 has been amended to read simply “on the surface of the semiconductor layer”. Thus, it is believed this objection is overcome.

Claims 3, 15 and 21 have been cancelled. Claims 6, 8, 14, 18, 20, 24, and 26 each ultimately depend on claim 1 or 2. Thus, it is believed that the objection to these claims is also overcome.

Claims 5, 7, 9, 13, 17, 19, 23, 25 and 27 were objected to as failing to clarify how electrodes in a claimed light emitting diode could be electrically connected to the substrate. With

this communication, claim 5 has been amended to recite a transparent substrate that is conductive. Thus, the electrode may be electrically connected with the transparent substrate. This amendment finds support in the specification at p. 13, lines 2-9. Claims 7, 9, 13, 17, 19, 23, 25 and 27 are each ultimately dependent on claim 5. It is believed, therefore, that this objection is overcome.

Rejections under 35 USC §112

Claims 1-3, 5-10, 13-15, 17-21 and 23-27 are rejected as allegedly failing to comply with the written description requirement.

In particular, the Examiner asserts that the recitation in claim 1 of the combination of a reflecting layer formed of metal on a back surface of on in the diode chip and that one of the electrodes is formed above the semiconductor layer via the reflecting layer is not fully supported by the original disclosure. With this communication, claim 1 has been amended to recite at least a light emitting diode chip including a pair of electrodes and a light reflecting layer wherein the pair of electrodes are formed on the semiconductor layer which is laminated on one side of the transparent substrate, the one side of the transparent substrate being opposite to the direction of light reflected by the light reflecting layer. Embodiments of this device are disclosed, for example, in Figures 3, 4 and 5 of the specification and discussed at least at page 9, lines 7 through page 10, line 3 and page 11, line 23 through page 12, line 4. In particular, at least page 9, lines 11-24 and page 10 lines 1-3 describe Figures 3 and 4 as illustrating a diode chip including a light reflecting layer 3 formed on a semiconductor layer 12, 13 and 14. Electrodes 5a and 5b are formed on the semiconductor layer. Also, at least page 11, line 23 through page 12, line 3 describe the emission from the light emitting layer collected with a reflection mirror an a surface opposite to the surface on which the chip electrode is formed. Thus, amended claim 1 is fully supported by the specification and it is believed that this rejection of claim 1 is overcome.

Claims 3, 15 and 21 have been cancelled. Claims 1, 2, 5-10, 13-14, 17-20 and 23-27 are ultimately dependent on amended claim 1. Thus, for the reasons discussed above, it is believed that this rejection of these claims is also overcome.

Rejections under 35 USC §103

Claims 1-3, 5-6, 8, 10, 13-18, 20, 21, 23, 24 and 26 are rejected as allegedly being unpatentable over U.S. Published Patent Application US 2002/0117672 A1 to Chu et. al. (“Chu”) in view of U.S. Patent No. 5,670,797 to Okazaki (“Okazaki”).

With this communication, claim 1 has been amended to recite at least an LED chip including a pair of electrodes for applying voltage to a semiconductor layer and a light reflecting layer formed of a metal thin film. The pair of electrodes is formed on the semiconductor layer which is laminated on one side of the transparent substrate, the one side of the transparent substrate being opposite to the direction of light reflected by the light reflecting layer.

Figure 1B of Chu discloses blue-light emitting diode which “may have the conductive layer thickened such that a reflection effect could probably be achieved.” (Chu, page 1, paragraph 0010). Figure 1B of Chu does not clearly disclose a location of this “conductive layer”. Amended claim 1, on the other hand, discloses a “light reflecting layer formed of a metal thin film”. No light reflecting layer that is formed of a metal thin film is disclosed in relation to Figure 1B of Chu. The Examiner argues that layer 110 of Figure 1B of Chu “should also be made of similar metal like the one of layer 105, since they both serve as a contact electrode for the top semiconductor layer in the LED; and that it naturally functions as a reflecting layer in Fig. 1B.” However, Chu discloses that “P-electrode 105” is “a light-permeable . . . electrode.” (Chu, page 1, paragraph 0007). Thus, the P-electrode 110 in Figure 1B would not act to reflect light, but rather to transmit light. And, nowhere does Chu disclose that P-electrode 110 in Figure 1B would act as a light reflecting surface. Thus, nowhere does Chu disclose a light reflecting layer formed of a thin metal film in relation to Figure 1B. Indeed, because P-electrode 110 of Figure 1B is “light permeable”, Chu would teach away from claim 1 of the present invention.

Additionally, amended claim 1 recites a pair of electrodes “formed on the semiconductor layer which is laminated on one side of the transparent substrate, said one side of the transparent substrate being opposite to the direction of light reflected by the light reflecting layer”. Chu

discloses a P-electrode 110, “metal bump” 112, N-electrode 111 and metal bump 113 formed on an LED. Figure 1B of Chu additionally discloses a sapphire base 107 on which the LED is formed. Figure 1B of Chu, however, discloses no light reflecting layer reflecting light in a direction opposite to the side of the sapphire base on which the LED is formed. Indeed, the arrows in Figure 1B of Chu do not appear to disclose light reflected from any surface, rather, just light emitted by the LED through base 107. Neither does Okazaki anywhere disclose such an element. Thus, the combination of Chu and Okazaki cannot render claim 1 obvious.

Moreover, in order for claim 1 of the present application to be obviated by Chu in view of Okazaki, there must be a motivation to combine the references. The Examiner argues that it would have been “obvious to one or ordinary skill in the art at the time of the invention was made to incorporate the vertical LED mounting structure of Okazaki into the LED of Chu, so that a LED with high reliability and easy form mass-production would be obtained.” However, there is no discussion in either Chu or Okazaki concerning the details of orienting a device such as that disclosed by Chu such that the PN-junction is perpendicular to the surface of a printed substrate. For example, there is no discussion in either reference concerning, placement of electrodes in a device such as that disclosed by Chu that would allow such perpendicular orientation of the PN-junction and it would not be obvious to one skilled in the art how to so locate the electrodes of a device of the type disclosed in Chu. Thus, amended claim 1 cannot be rendered obvious by the combination of Chu and Okazaki.

Claims 3, 15 and 21 have been cancelled. Claims 2, 5-6, 8, 10, 13, 14, 16-18, 20, 23, 24 and 26 are each ultimately dependent on claim 1 and are therefore also patentable over the cited references.

CONCLUSION

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to withdraw the outstanding rejection of the claims and to pass this application to issue. If it is determined that a telephone conference would expedite the prosecution of this application, the Examiner is invited to telephone the undersigned at the number given below.

In the event the U.S. Patent and Trademark office determines that an extension and/or other relief is required, applicant petitions for any required relief including extensions of time and authorizes the Commissioner to charge the cost of such petitions and/or other fees due in connection with the filing of this document to **Deposit Account No. 03-1952** referencing docket no. **259052002900**. However, the Commissioner is not authorized to charge the cost of the issue fee to the Deposit Account.

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Respectfully submitted,

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